

# Socioeconomic Gradients in Health for White and Mexican-Origin Populations

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Research on ethnic mortality differentials in the United States demonstrates that all-cause mortality rates among Hispanics are as low as or lower than those of the non-Hispanic White population, despite the much lower overall socioeconomic status (SES) of Hispanics.<sup>1–4</sup> In general, Hispanics have a socioeconomic profile comparable to African Americans, and they are even more likely than African Americans to lack health insurance coverage; in addition, their rates of health care service use are low. Nevertheless, Hispanics have considerably higher life expectancies than African Americans.<sup>5</sup> This pattern, known as the “Hispanic paradox,” also is observed with certain measures of health status and certain health-related behaviors. For example, numerous studies suggest that birthweights are higher and rates of tobacco and alcohol use are lower among Hispanics than among non-Hispanic Whites.<sup>6–8</sup>

However, there are large variations in this “paradox” according to national origin and immigrant status, and the paradox is not seen in all groups. For example, Puerto Ricans exhibit the highest mortality rates of any Hispanic group—and higher than those of non-Hispanic Whites—whereas rates among Mexicans, Central Americans, and South Americans are generally similar to or lower than those of the non-Hispanic White population.<sup>2,3,9</sup> In addition, overall mortality risks are significantly lower among Hispanic immigrants than among native-born Hispanics.<sup>4,10</sup>

Despite extensive research on the Hispanic paradox, a second, probably related, paradox has received less attention. A myriad of studies conducted in the United States and elsewhere have shown that higher SES—typically assessed according to education, income, and occupational status—is strongly associated with lower mortality rates and better health at all levels of the

**Objectives.** We assessed whether the few findings to date suggesting weak relationships between education and health-related variables among Hispanics are indicative of a more widespread pattern.

**Methods.** We used logistic regression models to examine education differentials (i.e., education gradients) in health behaviors and outcomes among White and Mexican-origin adults, adolescents, and infants. We gathered information from 3 data sets: the Los Angeles Family and Neighborhood Survey, the Fragile Families and Child Wellbeing Study, and the National Health Interview Survey.

**Results.** In contrast with patterns for Whites, education was weakly associated or not associated with numerous health-related variables among the US Mexican-origin population. Among adults, Mexican immigrants were especially likely to have weaker education gradients than Whites.

**Conclusions.** The weak relationships between education and health observed among individuals of Mexican origin may have been the result of several complex mechanisms: social gradients in health in Mexico that differ from those in the United States, selective immigration according to health and socioeconomic status, and particular patterns of integration of Mexican immigrants into US society. (*Am J Public Health.* 2006;96:2186–2193. doi:10.2105/AJPH.2005.062752)

socioeconomic ladder. These “social gradients” have been found in a wide range of populations and time periods and, at least in developed countries, typically characterize both health-related behaviors and health outcomes.<sup>11–14</sup> However, one exception appears to be the US Hispanic population, for whom education differentials are either weak or nonexistent in the case of numerous health-related variables.

Although government reports have sometimes provided SES-specific health status tabulations for Hispanics, few researchers have explicitly analyzed SES differentials. A recent analysis conducted as part of the National Longitudinal Mortality Study provided estimates of life expectancy, according to level of education, family income, and employment status, separately for Hispanics, non-Hispanic Whites, and African Americans. Although the authors did not provide data on any formal comparisons across ethnic categories, the results suggested smaller SES differentials among Hispanic groups than among the other groups assessed.<sup>15</sup>

Several other studies have revealed weaker gradients among Hispanics than among non-Hispanic Whites, typically for a single variable pertaining to health status or health-related behaviors. For example, relatively weak gradients among Hispanics have been reported for obesity,<sup>16</sup> smoking,<sup>17</sup> body mass index (BMI),<sup>18</sup> low birthweight,<sup>7,19–22</sup> blood pressure,<sup>23</sup> and clusters of cardiovascular risk factors.<sup>24</sup>

Two recent studies offer somewhat broader assessments. Crimmins et al.<sup>25</sup> noted the absence of education gradients in disease prevalence among Hispanics (and African Americans), although their analysis was restricted to elderly individuals. Winkleby and Cubbin<sup>8</sup> demonstrated that education and income differentials for 9 health-related variables were weaker among Hispanic adults than among Whites or African Americans. Nevertheless, in general, these weaker Hispanic gradients have been mentioned only in passing (if at all) in the research on social inequalities in health conducted to date; moreover, the scope of the patterns observed among Hispanics has not been recognized,

and little or no discussion has been offered regarding the underlying reasons for the small or nonexistent social gradients in this population.

In this study, we used 3 different data sets to examine associations between educational level and numerous health behaviors and outcomes in a specific group of Hispanics: Mexican-origin adults, adolescents, and infants. Also, we formulated several hypotheses in an attempt to explain differences in such associations between the Mexican-origin population of the United States and non-Hispanic Whites.

## METHODS

### Study Samples

Our analyses were based on data derived from (1) the Los Angeles Family and Neighborhood Survey (LAFANS), conducted during 2000 and 2001 in Los Angeles County; (2) the first 2 waves of the Fragile Families and Child Wellbeing Study (FFCWS), conducted in 20 US cities during 1998 to 2002; and (3) the 1997 through 2001 versions of the National Health Interview Survey (NHIS). Because of variations in health and survival status among Hispanic groups, we restricted the Hispanic sample to individuals of Mexican origin, who represented the largest Hispanic group in all of the data sets. Sample sizes were insufficient to allow consideration of other national origin groups.

The Mexican-origin sample of adults included in our analyses was made up of individuals born in Mexico ("Mexican immigrants") along with those born in the 50 states and the District of Columbia ("US-born Mexican Americans"). We present separate estimates for these 2 groups. The sample of Mexican-born adolescents (from LAFANS) was too small for analysis, and the infant sample (from the FFCWS) was restricted to those born in the United States. Ethnic classifications were based on respondents' self-reports, and questions regarding whether respondents were born in the United States were used to obtain information on nativity status.

LAFANS, which was based on a representative sample of households and neighborhoods in Los Angeles County, collected detailed information from randomly selected adults, children and their siblings, and primary

caregivers. The sample used in the current analysis included 2454 adults (18–94 years of age) and 814 adolescents (12–17 years of age). The FFCWS followed a birth cohort of new, mostly unwed parents and their children in 20 cities throughout the United States. Baseline interviews were conducted with mothers in the hospital shortly after delivery (we did not include data on interviews with fathers). We used data from the sample of mothers who responded to the first reinterview (90.5% of mothers), which occurred between 12 and 18 months after the child's birth. The sample included 1772 mothers (14–49 years of age) and the same number of infants (12–18 months of age).

The NHIS, a nationally representative cross-sectional survey of the civilian, noninstitutionalized population of the United States, has been conducted annually since 1957. To cover a time period similar to those covered by LAFANS and FFCWS, we used pooled data for the 5 annual waves of the NHIS conducted between 1997 and 2001. Although the questionnaire used varies from wave to wave, the items included in our analysis were generally the same within the period of the study with the exception of items focusing on depressive symptoms, which were included only in 1999. The sample used in this analysis was composed of 98 777 adults (18–64 years of age).

### Outcome and Explanatory Variables

We assessed 5 outcome variables among adult participants in the NHIS and LAFANS: smoking, heavy drinking, being overweight, having work limitations, and experiencing depressive symptoms (Table 1). In the case of the FFCWS, we used data only on smoking and work limitations (heavy drinking was rare in this sample of mothers, and data on the other outcomes were not available from these waves). Among adolescents in LAFANS, we examined smoking, drinking, and being overweight. We considered 4 outcomes (reported by the mother) for the FFCWS sample of infants: low birthweight, disability, asthma, and whether or not the child had been breastfed. All outcomes were binary variables in which 1 represented a negative behavior or health outcome.

The smoking variable indicated whether the respondent currently smoked (among adults) or whether he or she had ever

smoked (among adolescents). The drinking variable indicated whether the respondent was a binge or heavy drinker. Binge drinking was defined as consumption of at least 5 drinks on 1 or more occasions during the past 30 days (LAFANS); heavy drinking was defined as consumption of at least 5 drinks during a single given day at least once in the past year (NHIS). Among adolescents, we also examined whether or not they had ever consumed an alcoholic drink.

Participants' BMIs were derived from self-reported height and weight information in the NHIS and LAFANS. Adults with BMIs of 25 kg/m<sup>2</sup> or higher were classified as overweight or obese; for adolescents, the corresponding cut point was defined as a BMI at or above the age- and gender-specific 85th percentile.<sup>26</sup> The work limitations variable reflected whether respondents reported having health problems that limited their ability to work (specific item wording varied across the surveys; see Table 2). Depressive symptoms were measured with the Composite International Diagnostic Interview Short Form, scored to yield a probability that the respondent had been depressed during the past 12 months.<sup>27,28</sup>

Information for infants was based on mothers' reports shortly after the birth (for birthweight) or at the first reinterview. Low birthweight was defined as 2500 g or less. We assessed whether infants had any physical disability at 12 to 18 months of age and whether they had asthma at 12 to 18 months of age. In the case of all 3 surveys, explanatory variables included age (in complete years), gender, self-reported ethnicity (and, among adults, nativity), and completed years of education (continuous variable).

### Statistical Analysis

We used logistic regression models to determine the magnitude and statistical significance of education gradients in health (i.e., the slopes of the relations between education and the health measures). For each sample, we estimated separate logistic models for each health behavior or health outcome. Each model included variables for age, gender (with the exception of the FFCWS female adult sample), years of education, ethnicity/nativity (White vs Mexican origin or White vs Mexican immigrant vs US-born Mexican

**TABLE 1—Unweighted Descriptive Statistics for the National Health Interview Survey (NHIS; 1997–2001), Los Angeles Families and Neighborhoods Survey (LAFANS; 2000–2001), and Fragile Families and Child Wellbeing Study (FFCWS; 1998–2002) Samples**

	NHIS Adults				LAFANS Adults				LAFANS Adolescents		FFCWS Mothers				FFCWS Infants	
	Whites	All Mexicans	Foreign- Born Mexicans	US-Born Mexican Americans	Whites	All Mexicans	Foreign- Born Mexicans	US-Born Mexican Americans	Whites	Mexicans	Whites	All Mexicans	Foreign- Born Mexicans	US-Born Mexican Americans	Whites	Mexicans
No.	84 961	13 816	7721	6095	864	1590	1211	379	286	528	1024	748	363	385	1024	748
Male, %	46	46	48	42	35	31	31	29	51	49	...	...	...	...	52	50
Age, y, mean (SD)	40.7 (12.3)	35.7 (11.6)	35.6 (10.9)	35.8 (12.5)	44.2 (14.9)	35.9 (12.3)	36.7 (11.7)	33.7 (13.9)	13.0 (2.6)	12.7 (2.6)	28.1 (6.8)	25.6 (5.6)	27.1 (5.4)	24.4 (5.5)	1	1
Years of education, mean (SD)	13.6 (2.5)	10.1 (3.8)	8.6 (3.9)	11.9 (2.6)	14.7 (3.1)	9.2 (4.3)	8.2 (4.2)	12.6 (2.5)	14.9 (2.9)	7.9 (3.9)	13.5 (2.8)	10.6 (2.5)	9.7 (2.5)	11.5 (2.1)	13.5 (2.8)	10.6 (2.5)
Smoking, % <sup>a</sup>	29	19	16	22	16	12	11	14	...	...	37	14	5	22	...	...
Ever smoked, %	...	...	...	...	...	...	...	...	22	15	...	...	...	...	...	...
Binge/heavy drinking, % <sup>b</sup>	26	23	20	26	12	13	13	16	10	8	...	...	...	...	...	...
Ever consumed alcoholic drink, %	...	...	...	...	...	...	...	...	49	35	...	...	...	...	...	...
Overweight or obese, % <sup>c</sup>	54	65	64	66	45	67	67	65	24	42	...	...	...	...	...	...
Work limitations, % <sup>d</sup>	10	7	5	9	16	10	9	12	...	...	6	7	7	7	...	...
Depressive symptoms, % <sup>e</sup>	8	5	3	7	16	14	13	15	...	...	...	...	...	...	...	...
Not breastfed, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38	39
Low birthweight, % <sup>f</sup>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	5
Physical disability, % <sup>g</sup>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
Asthma, %	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	12

<sup>a</sup>For the NHIS: respondents who had smoked at least 100 cigarettes and who reported that they currently smoked every day or some days. For LAFANS and FFCWS: respondents who reported that they currently smoked.

<sup>b</sup>Binge drinking was defined as having consumed at least 5 drinks on 1 or more occasions in the past 30 days (LAFANS); heavy drinking entailed having consumed at least 5 drinks during 1 day at least once in the past year (NHIS).

<sup>c</sup>Defined as a body mass index of 25.0 kg/m<sup>2</sup> or higher for adults. Defined as a body mass index at or above the age- and gender-specific 85th percentile for adolescents.

<sup>d</sup>Respondent has physical or psychological problems (LAFANS); physical, mental, or emotional problems (NHIS); or serious health problems (FFCWS) that limit his or her ability to work.

<sup>e</sup>Probability that the respondent had been depressed during the past 12 months. In the NHIS, a depression measure was available only for the year 1999 (15 650 Whites, 1234 US-born Mexican Americans, and 1411 foreign-born Mexicans); in LAFANS, the question was asked only of primary caregivers (418 Whites, 197 US-born Mexican Americans, and 702 foreign-born Mexicans).

<sup>f</sup>Defined as birthweight ≤ 2500 grams.

<sup>g</sup>Mother reports that child has any physical disability.

American), and interaction terms between ethnicity/nativity and years of education. Educational level referred to the primary caregiver in the LAFANS adolescent sample and the mother in the FFCWS infant sample.

Individuals missing information on any of the explanatory or outcome variables were excluded from the analysis. The number of missing observations varied across health outcomes but was typically small and unlikely to have biased the estimates. For example, the percentage of NHIS observations with missing information on either the explanatory variables or the outcome ranged from approximately 1% (for smoking and work limitations) to approximately 4% (for overweight or obese). For the NHIS and LAFANS, we used survey commands in Stata software that

adjusted for clustering and stratification in estimations of standard errors.<sup>29</sup>

Tables 2 through 4 present the estimated coefficients for the years of education variable. On the basis of previous research, we expected to find *negative* coefficients; that is, higher education levels should be associated with lower prevalences of negative outcomes (e.g., lower smoking rates). As a means of facilitating interpretation of the interaction term between ethnicity and education, coefficients are displayed separately according to ethnic/nativity group in these tables. The (2-sided) *P* values associated with these estimates are also presented for each group, along with the corresponding *P* values for *t* tests of differences in estimates between individuals of Mexican origin and Whites.

Sample sizes varied slightly across the different outcomes because of differences in amounts of missing data. The models for depressive symptoms were derived from samples much smaller than those for the other variables, because these data were collected in only 1 of the 5 NHIS years assessed and for only a subset of LAFANS respondents. The maximum sample sizes for each ethnic/nativity group are presented in Tables 2 through 4, along with the specific sample sizes for each outcome.

## RESULTS

Table 1 presents sample sizes and average values (unweighted) for each of the variables included in the statistical models, separately by ethnic/nativity group and analysis sample (i.e.,

**TABLE 2—Logistic Regression Coefficients for Years of Education: National Health Interview Survey (1997–2001), Los Angeles Families and Neighborhoods Survey (2000–2001), and Fragile Families and Child Wellbeing Study (1998–2002) Adult Samples**

	Whites, Coefficient (P)	All Mexicans, Coefficient (P)	Difference	Foreign-Born Mexicans, Coefficient (P)	Difference	US-Born Mexican Americans, Coefficient (P)	Difference
<b>NHIS adults<sup>a</sup></b>							
Maximum no.	84 069	13 565		7534		6031	
Smoking <sup>b</sup>	−0.23 (<.001)	−0.02 (.001)	<.001	−0.03 (.001)	<.001	−0.10 (<.001)	<.001
Heavy drinking <sup>c</sup>	0.01 (.056)	0.02 (.003)	.087	−0.02 (.028)	.007	0.01 (.732)	.868
Overweight or obese <sup>d</sup>	−0.06 (<.001)	−0.03 (<.001)	<.001	−0.05 (<.001)	.030	−0.06 (<.001)	.706
Work limitations <sup>e</sup>	−0.21 (<.001)	−0.03 (.001)	<.001	−0.05 (<.001)	<.001	−0.15 (<.001)	.001
Depressive symptoms <sup>f</sup>	−0.11 (<.001)	0.04 (.110)	<.001	0.02 (.578)	.004	−0.06 (.145)	.286
<b>LAFANS adults<sup>g</sup></b>							
Maximum no.	864	1586		1207		379	
Smoking <sup>b</sup>	−0.23 (<.001)	0.00 (.959)	<.001	−0.03 (.352)	<.001	0.03 (.611)	<.001
Binge drinking <sup>c</sup>	−0.08 (.022)	0.02 (.283)	.009	0.01 (.792)	.023	0.06 (.291)	.046
Overweight or obese <sup>d</sup>	−0.06 (.028)	−0.02 (.156)	.203	−0.03 (.111)	.290	0.01 (.891)	.243
Work limitations <sup>e</sup>	−0.15 (<.001)	−0.06 (.001)	.015	−0.09 (.001)	.093	−0.31 (.005)	.155
Depressive symptoms <sup>f</sup>	−0.11 (.021)	0.00 (.813)	.021	0.00 (.843)	.037	−0.02 (.826)	.286
<b>FFCWS mothers<sup>h</sup></b>							
Maximum no.	941	658		303		355	
Smoking <sup>b</sup>	−0.28 (<.001)	0.06 (.213)	<.001	0.11 (.297)	<.001	−0.12 (.047)	.004
Work limitations <sup>e</sup>	−0.26 (<.001)	−0.15 (.014)	.204	−0.06 (.541)	.052	−0.33 (.001)	.505

Note. NHIS = National Health Interview Survey; LAFANS = Los Angeles Families and Neighborhoods Survey; FFCWS = Fragile Families and Child Wellbeing Study. For each health outcome, the logistic model includes years of education, age, gender (except for FFCWS, in which all of the respondents were women), ethnicity/nativity (White vs Mexican origin or White vs foreign-born Mexican vs US-born Mexican American), and interaction terms between years of education and ethnicity/nativity. In the case of the NHIS and LAFANS, standard errors were adjusted for clustering and stratification. Differences are *P* values derived from *t* tests of differences between the Mexican-origin population (all Mexicans, foreign-born Mexicans, or US-born Mexican Americans) and Whites.

<sup>a</sup>The samples excluded cases with missing information on the outcome and independent variables. Sample sizes were as follows: smoking, 83 946 Whites, 6031 US-born Mexican Americans, 7534 foreign-born Mexicans; heavy drinking, 81 953 Whites, 5903 US-born Mexican Americans, 7383 foreign-born Mexicans; overweight or obese, 81 563 Whites, 5900 US-born Mexican Americans, 7166 foreign-born Mexicans; and work limitations, 84 069 Whites, 5999 US-born Mexican Americans, 7479 foreign-born Mexicans.

<sup>b</sup>For the NHIS: respondents who had smoked at least 100 cigarettes and who reported that they currently smoked every day or some days. For LAFANS and FFCWS: respondents who reported that they currently smoked.

<sup>c</sup>Binge drinking was defined as having consumed at least 5 drinks on 1 or more occasions in the past 30 days (LAFANS); heavy drinking entailed having consumed at least 5 drinks during 1 day at least once in the past year (NHIS).

<sup>d</sup>Defined as a body mass index of 25.0 kg/m<sup>2</sup> or higher.

<sup>e</sup>Respondent has physical or psychological problems (LAFANS); physical, mental, or emotional problems (NHIS); or serious health problems (FFCWS) that limit his or her ability to work.

<sup>f</sup>Probability that the respondent had been depressed during the past 12 months. In the NHIS, a depression measure was available only for the year 1999 (15 650 Whites, 1234 US-born Mexican Americans, and 1411 foreign-born Mexicans); in LAFANS, the question was asked only of primary caregivers (418 Whites, 197 US-born Mexican Americans, and 702 foreign-born Mexicans).

<sup>g</sup>The samples excluded cases with missing information on the outcome and independent variables. Sample sizes were as follows: smoking, 855 Whites, 368 US-born Mexican Americans, 1188 foreign-born Mexicans; binge drinking, 864 Whites, 379 US-born Mexican Americans, 1207 foreign-born Mexicans; overweight or obese, 798 Whites, 333 US-born Mexican Americans, 1071 foreign-born Mexicans; and work limitations, 857 Whites, 368 US-born Mexican Americans, 1188 foreign-born Mexicans.

<sup>h</sup>The samples excluded cases with missing information on the outcome and independent variables. Sample sizes were as follows: smoking, 941 Whites, 355 US-born Mexican Americans, 303 foreign-born Mexicans, and work limitations, 940 Whites, 355 US-born Mexican Americans, 303 foreign-born Mexicans.

age group and data set). Tables 2, 3, and 4 provide the results of the statistical analyses for adults, adolescents, and infants, respectively. All coefficients pertain to the variable designating years of education among respondents themselves (NHIS), primary caregivers (for LAFANS adolescents), or mothers (for FFCWS infants).

The coefficients shown in Table 2 allowed us to (1) identify whether there were significant negative associations between education

and the health variables assessed among both White adults and Mexican-origin adults, (2) determine whether the associations for adults of Mexican origin differed significantly from (i.e., were weaker than) the corresponding associations for Whites, and (3) determine whether associations were relatively weak among both US-born Mexican Americans and Mexican immigrants. Estimated coefficients for the full sample of Hispanics

(data not shown) were very similar to those for the Mexican-origin subpopulation.

Consistent with the literature, all of the coefficients for Whites shown in Table 2 (except the NHIS coefficient for heavy drinking) were negative and statistically significant (*P*<.05). That is, more educated White adults engaged in less risky health behaviors and had better health outcomes than less educated White adults. Results for the Mexican-origin sample



as a whole were less clear cut: estimates from the NHIS indicated significant gradients for all outcomes other than depressive symptoms (although the coefficient for heavy drinking was positive), whereas estimates from the FFCWS and LAFANS indicated that education differences were significant only for work limitations.

Given the much larger sample sizes in the NHIS, these differences across surveys are not surprising. With the exception of work limitations, the coefficients for individuals of Mexican origin were very close to zero or even slightly positive, suggesting little or no differences according to education. For most of these health measures, the differences in education gradients between White and Mexican-origin adults were statistically significant (Table 2). Moreover, some were quite large; for example, the education gradient in smoking was substantial among Whites and small in the Mexican-origin population in all 3 surveys. Despite the different sampling frames, the findings were remarkably consistent across the surveys.

The coefficients estimated from the NHIS for Mexican immigrants and US-born Mexican Americans (Table 2) suggest that, in general, education gradients for these health measures were negative (and significant) in both groups. Nevertheless, some of these gradients were small, and most were not significantly different from zero when they were estimated from LAFANS and FFCWS data. The most striking exceptions were the negative gradients for work limitations among both Mexican immigrants and US-born Mexican Americans and the negative gradient for smoking among US-born Mexican Americans (FFCWS). Statistical comparisons (Table 2) revealed that many of the gradients for Mexican immigrants and several for US-born Mexican Americans were significantly different from those for Whites.

These comparisons suggest that estimated education gradients were weaker (i.e., less negative) among Mexican immigrants than among US-born Mexican Americans for some of the health measures. Statistical tests (data not shown) indicated that, in the case of 2 of the NHIS outcomes (smoking and work limitations), gradients for Mexican immigrants were significantly different ( $P < .05$ ) from those for US-born Mexican Americans. However, the corresponding tests for the FFCWS and

**TABLE 3—Logistic Regression Coefficients for Primary Caregivers' Years of Education: Los Angeles Families and Neighborhoods Survey (2000–2001) Adolescent Sample**

	Whites, Coefficient (P)	Mexicans, Coefficient (P)	Difference
Ever smoked <sup>a</sup>	-0.13 (.034)	0.01 (.801)	.048
Ever consumed alcoholic drink	-0.03 (.685)	0.01 (.787)	.613
Binge drinking <sup>b</sup>	-0.20 (.137)	0.00 (.969)	.168
Overweight or obese <sup>c</sup>	-0.17 (.012)	0.00 (.928)	.026
No. (maximum)	286	528	

*Note.* For each health outcome, the logistic model includes primary caregiver's years of education, age, gender, ethnicity (White vs Mexican), and an interaction term between primary caregiver's years of education and ethnicity. Standard errors were adjusted for clustering and stratification. The samples excluded cases with missing information on the outcome and independent variables. Sample sizes were as follows: ever smoked, 286 Whites and 528 Mexicans; ever consumed alcoholic drink, 189 Whites and 317 Mexicans; binge drinking, 189 Whites and 317 Mexicans; and overweight or obese, 186 Whites and 273 Mexicans. Values in the Difference column are *P* values derived from *t* tests of between-group differences.

<sup>a</sup>Asked of participants aged 9 to 17 years.

<sup>b</sup>Adolescent reported having consumed 5 or more drinks on 1 or more occasions in the past 30 days.

<sup>c</sup>Body mass index at or above the age- and gender-specific 85th percentile.

LAFANS indicated that the difference between US-born Mexican Americans and Mexican immigrants was statistically significant ( $P < .05$ ) only for work limitations (and only in LAFANS).

The estimated coefficients for Mexican-origin and White adolescents in LAFANS, shown in Table 3, reveal a similar pattern to that for adults. For the 4 outcomes, the education gradients for White adolescents' primary caregivers were negative and, in the case of 2 of the measures, significantly different from zero. For all 4 measures, the gradients for Mexican-origin adolescents were very close to zero and not statistically significant, and for 2 of the measures the differences between ethnic groups were statistically significant.

The results for FFCWS infants, shown in Table 4, corroborated the findings for the other age groups. Among White infants, the associations between maternal educational levels and health outcomes were negative and statistically significant for all 4 measures. The corresponding estimates for Mexican-origin infants were substantially closer to zero (in some cases they were positive and in others negative) but were not significantly different from zero for any of the 4 outcomes.

## DISCUSSION

Our study identifies a striking phenomenon in the US Mexican-origin population that has

**TABLE 4—Logistic Regression Coefficients for Mothers' Years of Education: Fragile Families and Child Wellbeing Study (1998–2002) Infant Sample**

	Whites, Coefficient (P)	Mexicans, Coefficient (P)	Difference
Low birthweight <sup>a</sup>	-0.16 (.001)	0.08 (.268)	.004
Physical disability	-0.20 (.022)	0.10 (.379)	.033
Asthma	-0.22 (.001)	-0.02 (.736)	.024
Never breastfed	-0.24 (<.001)	-0.04 (.234)	.001
No. (maximum)	1020	749	

*Note.* For each health outcome, the logistic model includes mother's years of education, age, gender, ethnicity (White vs Mexican), and an interaction term between mother's years of education and ethnicity. Health outcomes were reported by the mother. The final samples excluded cases with missing information on the outcome and independent variables. Sample sizes were as follows: low birthweight, 998 Whites and 733 Mexicans; physical disability, 936 Whites and 654 Mexicans; asthma, 841 Whites and 440 Mexicans; and not breastfed, 1020 Whites and 749 Mexicans. Values in the Difference column are *P* values derived from *t* tests of between-group differences.

<sup>a</sup>2500 g or less.

received little attention in the public health and social science literatures: the absence of notable education differentials for numerous health-related variables among infants, adolescents, and adults versus the corresponding patterns for Whites. In the case of adults, these weak gradients appeared more frequently among Mexican immigrants than among US-born Mexican Americans, although numerous differences between these 2 Mexican-origin groups were not statistically significant.

### Possible Explanations

What factors are likely to explain these findings? We speculate that a combination of several complex mechanisms is involved. One possibility is that social gradients in Latin America are weak or reversed relative to those in the United States. For example, studies have shown that, in Latin America, higher SES is associated with higher obesity levels.<sup>30–32</sup> In addition, research conducted in Mexico reveals that individuals of higher SES are more likely than those of lower SES to smoke<sup>33–35</sup> and, among adolescents, to use alcohol.<sup>33</sup>

We speculate that the reason for these flat or reversed social gradients is that, in Mexico, those who are poor are unable to afford higher calorie foods, cigarettes, or alcohol and are more likely to engage in exercise (through manual labor) than individuals of higher SES. Because health-related habits are often formed by early adulthood, social differentials in health among recent Mexican immigrants are likely to be similar to those among people living in Mexico. Because parental health behaviors have a substantial influence on the behavior of children and adolescents,<sup>36</sup> these patterns may also be reproduced, at least in part, in subsequent generations.

A second possibility is related to the “healthy migrant” hypothesis; that is, healthy individuals in Mexico and other countries of origin are believed to be more likely than less healthy individuals to immigrate to the United States.<sup>4</sup> We believe that this selective migration process is likely to be especially prevalent among the poor. Although such an explanation seems plausible given that wealthier potential immigrants have access to many more resources to facilitate their migration than do poor residents, there is, to our knowledge, virtually no supporting or refuting evidence.

If either or both of these migration-related explanations are primarily responsible for the relatively weak education gradients found among individuals of Mexican origin, we would expect Mexican immigrants to have weaker gradients than US-born Mexican Americans. Our results revealed that whereas this was true for some health measures (particularly work limitations), the differences between Mexican immigrants and US-born Mexican Americans were quite modest for other outcomes (drinking and obesity), and many were not statistically significant. Moreover, the gradients for US-born Mexican Americans were sometimes weaker than those for non-Hispanic Whites, suggesting that there may be other explanations for these findings.

A third set of hypotheses, which we refer to broadly as acculturation and assimilation, also may be important. These explanations are linked with a compositional effect that derives from differing distributions of nativity according to level of education: Hispanics at relatively high education levels are more apt to be second-generation (or higher) immigrants and to have resided longer in the United States than those at low education levels. The public health literature suggests that although immigrants from Latin America may arrive in the United States with relatively healthy values and behaviors, these values and behaviors gradually disappear during the process of assimilation.<sup>37,38</sup> Moreover, the discrimination and lack of opportunity faced by members of some immigrant groups may result in their adopting detrimental behaviors and experiencing the negative health consequences associated with chronic stress.<sup>39,40</sup>

An alternative perspective, known as “segmented assimilation,” suggests that immigrants from less favored ethnic groups have little alternative but to assimilate into disadvantaged segments of US society. As a result, they adopt the poor health behaviors of others around them and ultimately experience negative health outcomes.<sup>41,42</sup> Taken together, these migration and acculturation hypotheses may account for the pattern observed here in which less educated Hispanics fared better than their White counterparts on numerous health variables and more educated Hispanics sometimes fared worse (data not shown).

### Future Directions

Future research based on detailed data on immigrants in the United States, combined with national survey data from Mexico, can provide insights into these potentially complementary mechanisms. Data from LAFANS are ideally suited for such an undertaking because of the breadth of information included on immigrants’ characteristics (e.g., duration in the United States, age at immigration, degree of acculturation, and region of residence in Mexico), their mobility history within the United States, and the characteristics of the neighborhoods in which they reside (e.g., ethnic composition, immigrant and language concentration, and social cohesion). Additional analyses may also provide information regarding potential nonlinearities in education gradients. Studies of this type are likely to lead to an increased understanding of Hispanic health, both in the United States and in immigrants’ countries of origin.

Although weak social gradients in health may appear to be desirable because they signal the absence of social inequalities, disparities in health within the Hispanic population and between Hispanics and other groups are large.<sup>43,44</sup> The Hispanic mortality paradox suggests that the health status of Hispanics is superior to that of Whites, but deeper investigation reveals that this advantage is largely restricted to immigrants.<sup>4</sup> Although overall Hispanics have better mortality profiles than Whites, they are more likely than Whites to die from some leading causes (e.g., HIV/AIDS and diabetes<sup>45</sup>) and to suffer from certain chronic conditions (e.g., obesity<sup>46</sup>). These disparities, combined with low rates of health insurance coverage and use of health care<sup>47</sup> and health-related behaviors that may worsen with length of residence in the United States,<sup>48</sup> are likely to foreshadow future health problems for the US Hispanic population.

The patterns of social disparities in health in Mexico and other immigrant countries of origin are likely to change over the coming decades. Indeed, there is already evidence that some of the reverse social gradients in Latin American countries are changing direction as living standards rise, with those living in poverty becoming more disadvantaged relative to their more educated and wealthier counterparts across a broader spectrum of

health measures.<sup>49,50</sup> Given the likelihood that high rates of immigration from Latin America will continue and that one quarter of the US population will be Hispanic by 2050, increased attention to these enigmatic patterns is essential.<sup>51</sup> ■

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### Contributors

N. Goldman and A.R. Pebley originated the study, and N. Goldman supervised its implementation. All of the authors assisted in the development of the analytical strategy and the interpretation of results. R.T. Kimbro and C.M. Turra performed the statistical analyses. All authors reviewed drafts of the article.

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No protocol approval was needed for this study.

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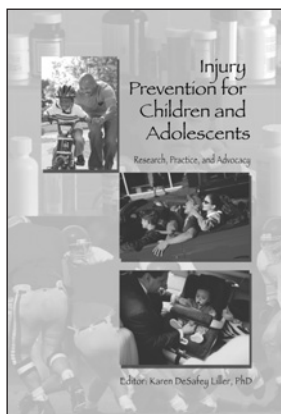
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